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Publication date:
2018

Document Version
Peer reviewed version

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TOPIC: Advanced concepts and components- monitoring results

SUMMARY

Large scale solar heating plants develop fast in Europe, especially in Denmark. Most solar collectors used in previous solar heating plants are flat plate collectors. Flat plate collectors have relatively low efficiency at high temperature levels, such as 70 - 95 ℃, which is the supply temperature of district heating networks. Parabolic trough collectors keep a high efficiency at the high temperature level. To maximize the advantages of flat plate collectors and parabolic trough collectors, a novel combined solar heating plant with flat plate collectors and parabolic trough collectors in series has been constructed in Taars, Denmark. The flat plate collectors preheat the return water from the district heating networks to about 75℃, then the parabolic trough collectors heat the preheated water from the flat plate collector field to the required supply temperature of the district heating network. The thermal performance of the combined plant was measured from September, 2015. More than 2 years` thermal performance will be presented in this paper.
Key-words: Taars solar heating plant, parabolic trough collector, flat plate collector, thermal performance

1. Introduction

The number of large solar heating plants in Denmark has increased strongly during the last couples of years. Most solar collectors in the solar heating plants are flat plate collectors. The feasibility of parabolic trough collectors in solar heating plants has been investigated for Danish conditions [1]. A combined solar heating plant with a 5960 m^2 flat plate collector field and a 4032 m^2 parabolic trough collector field has been in operation in Taars since August 2015 [2], see Figs.1-2. The flat plate collectors preheat the return water from the district heating network to about 75℃, then the parabolic trough collectors heat the preheated water from the flat plate collector field to the required supply temperature of the district heating network.

Fig.1. Overview of the flat plate and parabolic trough collector fields in Taars solar heating plant [2].

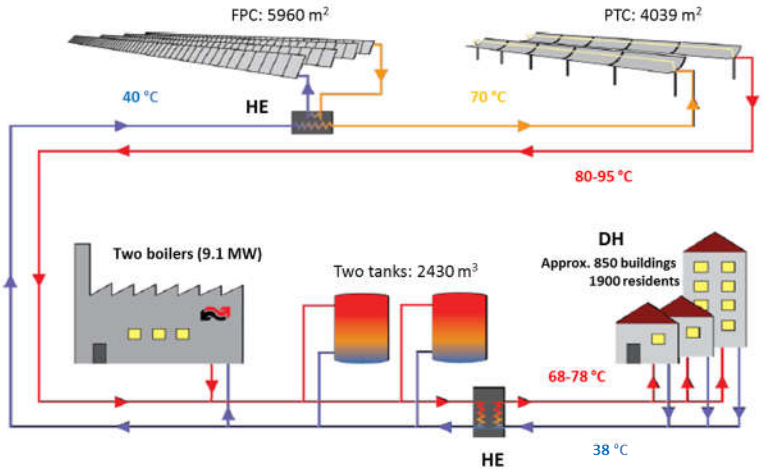

Fig.2. Schematic illustration of Taars solar heating plant.

2. Methods

The inlet temperature, outlet temperature, flow rate etc. of the parabolic trough collector field and the flat plate collector field have been measured. Daily and monthly thermal performances of the parabolic trough collector field and the flat plate collector fields are determined based on the measured data. A Trnsys model has been validated by the measurements [3].

3. Results and conclusions

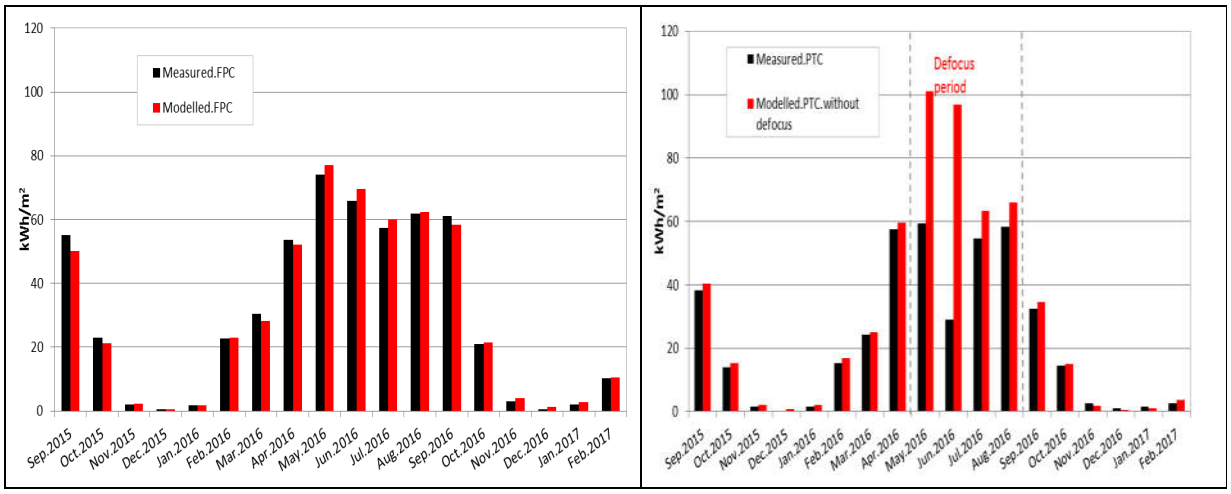

Fig.3. Thermal performances of flat plate collector field and parabolic trough collector field.

Fig.3. shows both measured and simulated performances of the flat plate collector field and parabolic trough collector field. Simulated and measured performances from September 2015 to February 2017 have a good agreement. More measurements and calculations of the thermal performances of both fields will be presented in the paper.

References

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